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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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09/469,652

12/22/1999

JONATHAN J. WIERER JR.

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06/28/2004

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EXAMINER

BAUMEISTER, BRADLEY W

ART UNIT

PAPER NUMBER

2815

DATE MAILED: 06/28/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/469,652

Applicant(s)

WIERER ET AL.

Examiner

B. William Baumeister

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 1 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 07 April 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1,3,5-11,14-16 and 18-35 is/are pending in the application.
- 4a) Of the above claim(s) 1,3,5-10,14,19,21-25 and 32-34 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 11,15,16,18,20,26-31 and 35 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☒ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 4/7/04.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

**DETAILED ACTION**

1. This application has been reassigned to a different, primary Examiner.

***Election/Restrictions***

2. Restriction to one of the following inventions is required under 35 U.S.C. 121:
  - I. Claims 11, 14-16, 18, 20, 26-35, drawn to a light emitter having a multilayer contact including an ohmic metal contact sheet and a reflector layer, classified in class 257, subclass 79+.  
  
Species I: Claims 31 and 35, directed towards the species wherein the conducting sheet comprises NiO and Au.  
  
Species II: Claim 32, directed towards the species wherein the conducting sheet comprises Ti.  
  
Species III: Claim 33, directed towards the species wherein the conducting sheet comprises Rh.  
  
Species IV: Claim 34, directed towards the species wherein the conducting sheet comprises Cu.
  - II. Claims, 1, 3, 5-10, 19 and 21-25 drawn to a light emitter having a multilayer contact including an ohmic metal contact sheet, a barrier layer and a reflector layer, classified in class 257, subclass 79+.

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The inventions are distinct, each from the other because of the following reasons:

3. Inventions II and I are related as combination and subcombination. Inventions in this relationship are distinct if it can be shown that (1) the combination as claimed does not require the particulars of the subcombination as claimed for patentability, and (2) that the subcombination has utility by itself or in other combinations (MPEP § 806.05(c)). In the instant case, the combination as claimed does not require the particulars of the subcombination as claimed because unlike claim 19 (directed towards Bsp), the combination claims may be used in conjunction with a III-As or a III-P emitter. The subcombination has separate utility such as a multilayer contact that does not include the additional barrier layer.

4. Because these inventions are distinct for the reasons given above and the search required for Group II is not required for Group I, restriction for examination purposes as indicated is proper.

5. This application also contains claims directed to the patentably distinct species of the claimed invention, set forth above as species I-IV:

If Applicant elects invention I, Applicant is further required under 35 U.S.C. 121 to elect a single disclosed species for prosecution on the merits to which the claims shall be restricted if no generic claim is finally held to be allowable. Currently, claims 11, 14-16, 18, 20 and 26-30 are generic.

Applicant is advised that a reply to this requirement must include an identification of the species that is elected consonant with this requirement, and a listing of all claims readable thereon, including any claims subsequently added. An argument that a claim is allowable or that all claims are generic is considered nonresponsive unless accompanied by an election.

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Upon the allowance of a generic claim, applicant will be entitled to consideration of claims to additional species which are written in dependent form or otherwise include all the limitations of an allowed generic claim as provided by 37 CFR 1.141. If claims are added after the election, applicant must indicate which are readable upon the elected species. MPEP § 809.02(a).

Should applicant traverse on the ground that the species are not patentably distinct, applicant should submit evidence or identify such evidence now of record showing the species to be obvious variants or clearly admit on the record that this is the case. In either instance, if the examiner finds one of the inventions unpatentable over the prior art, the evidence or admission may be used in a rejection under 35 U.S.C. 103(a) of the other invention.

6. During a telephone conversation with Rachel Lieterman on 6/22/04 a provisional election was made without traverse to prosecute the invention I, Species I, claims 11, 14-16, 18, 20, 26-31 and 35. Affirmation of this election must be made by applicant in replying to this Office action. Claims 1, 3, 5-10, 19, 21-25 and 32-34 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

***Claim Rejections - 35 USC § 102 and §103***

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

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8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claims 11, 15, 26 and 27 are rejected under 35 U.S.C. 102(b) as being anticipated by EP 0 051 172 (previously made of record in the IDS of 12/22/99).

a. EP '172 discloses a pn light emitter having a reflective ohmic contact 10. This contact is composed of a first, 20 nm AuGe layer 12 that contacts the n semiconductor layer 2; a second, 800 nm Ag layer 13; and a third, 500 nm Au layer 14.

b. The first AuGe layer reads on the continuous uniform conducting sheet; and either (1) the Ag layer 13, (2) the Au layer 14 or (3) the layers 13 and 14 in combination, read on the metal reflector. Claim 26 is anticipated by the third interpretation

c. Regarding the limitations that the reflectivity is greater than 75% (e.g., claim 11), and that the resistivity is less than  $10e-2 \text{ ohm-cm}^2$  (e.g., claim 27), Applicant's specification evidences that the Ag layer of EP '172 will necessarily possess/produce such a reflectivity because of its composition and thickness. (See e.g., Applicant's specification, page 4).

10. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over EP 172 as applied to the claims above. Claim 16 sets forth that the thickness of less than 200 angstroms (or 20 nm). Assuming *arguendo* that this limitation is not anticipated by the EP '172 disclosure of 20

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nm (as opposed to “less than” 20 nm), the claim is none the less obvious because the reference teaches the general conditions, and therefore providing a AuGe layer of a thickness infinitesimally smaller than that disclosed by EP ‘172 does not produce any unexpected results.

11. Claims 27 and 28 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over EP ‘172 as applied to the claims above.

a. EP ‘172 discloses the general conditions qualitatively: a highly reflective and highly ohmic contact, but does not expressly state what the associated particular quantitative resistivity and absorption values are for the ohmic conductive layer 12.

Applicant’s specification evidences that restricting the ohmic layer to a thickness of < 20 nm produces the resistivity and absorption levels set forth in the claims.

b. As such, Applicant’s specification provides evidence that the 20 nm ohmic AuGe layer 12 of EP ‘172 inherently possesses the quantitative values that satisfy the limitations. (See the discussion of the ohmic contact material’s thickness at e.g., page 4 of the present specification), and therefore, the claims are anticipated.

c. Alternatively, assuming *arguendo* that the 20 nm AuGe layer of EP ‘172 does not inherently meet these quantitative values set forth in the claims, the claims are nonetheless obvious. this is because EP ‘172 discloses the general goals, and the general means and conditions for achieving these goals. As such, achieving the values claimed would constitute an optimization of results achievable by one of ordinary skill in the art at the time of the invention through routine experimentation.

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12. Claims 11, 15, 16, 20, 26-28 and 30 are rejected under 35 U.S.C. 102(b) as being anticipated by Mensz et al., "InGaN/AlGaN violet light emitting diodes with reflective p-contacts for high single sided light extraction," (previously cited by applicant).

a. Mensz discloses various p-contact bi-layers for GaN-based (or III-N) light emitters, including a 3.5 nm Ni / 200 nm Al sample that produces a reflectivity of 85%. (e.g., page 2067, col. 2).

13. Claims 11, 15, 16, 18, 20 and 26-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brown et al., "Ohmic contacts to Si-implanted and un-implanted n-type GaN," Mat. Res. Soc. Symp. Proc. Vol. 395, 1996 Materials Research Society, pp. 855-860.

a. Brown discloses n-contacts for III-N devices that are composed of 150 angstrom Ti / 2000 angstroms Al formed on n-GaN; the specific resistance is  $1.4 \times 10^{-5}$  ohm-cm<sup>2</sup> (e.g., page 856, second paragraph). Brown does not disclose that one of the types of devices for which these contacts may be employed is light emitters. It was well known to those of ordinary skill in the art at the time of the invention to use GaN-based materials in pn or pin light-emitter applications and it would have been obvious to do so for the purpose of providing such a large bandgap light emitter having a low-resistance, ohmic contact as taught by Brown.

b. The other limitations claimed are inherently met due to the thicknesses of the respective contact layers.



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14. Claims 29 is rejected under 35 U.S.C. 103(a) as being unpatentable over Brown et al., "Ohmic contacts to Si-implanted and un-implanted n-type GaN," Mat. Res. Soc. Symp. Proc. Vo., 395, 1996 Materials Research Society, pp. 855-860 as applied to the claims above in view of Applicant's prior art admissions.

a. Brown does not teach that the forward bias voltage  $V_f$  for such an emitter may be less than 3.5 V. Applicant acknowledges that it was known to provide GaN-based LEDs that possess such a low  $V_f$ . It would have been obvious to one of ordinary skill in the art at the time of the invention employing such an LED to have employed the present n-contact structure for the purpose of providing a reliable n-contact structure while simultaneously either maintaining or further reducing the low  $V_f$ .

15. Claims 11, 15, 16, 18, 20, 26-30 and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ming-Jiunn et al. '064, and further in view of Applicant's prior art admissions.

a. Ming-Jiunn discloses p-contact schemes for GaN-base LEDs. See e.g., FIG6 wherein a Ni/Au conductive layer 42 is employed. It has a thickness of less than 100 angstroms (col. 3, lines 29-31); and together with the overlying ITO layer provides a transmission of over 85-90% (col. 2, lines 23-; col. 3, lines 15-) and a resistivity of  $3e-4$  ohm-cm (col. 3, lines 19-21). It is unclear whether the overlying p-electrode 10 possesses a reflectivity of  $> 75\%$ .

b. Applicant acknowledges that it was well known that Al and Ag electrodes have such reflectivities, and that the desire to provide these reflective compositions for GaN-

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based p-electrodes was known, but that the use of these materials caused diffusion and barrier-height problems when provided in contact with the III-N semiconductor material.

c. It would have been obvious to one of ordinary skill in the art at the time of the invention to have specifically substituted Al or Ag for the p-electrode 10 of Min-Jiunn's LED of at least FIG. 6 for use in lighting applications desiring a reflective p-contact—which applicant acknowledges was known—because the layers 42 and 11B of Ming-Jiunn are highly transparent and it was known by the ordinarily skilled artisan how to form Ag and Al on ITO.

16. Claim 31 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ming-Jiunn/Applicant's Prior Art admissions as applied to the claims above, and further in view of Kamakura et al. '423.

a. Ming-Jiunn/Applicant's Prior Art admissions teaches all of the limitations of the base claim 11, but does not further teach that the Ni of layer 42 may be oxidized.

b. Kamakura teaches p-contacts for III-V light emitters and specifically teaches a 5 nm (or more generally 1-100 nm; col. 5) Ni / 10 nm Au bi-layer (col. 4, lines 9-) wherein the surface of the Ni is oxidized to form NiOx, and thereby improve light transmission relative to Ni/Au contacts. Kamakura's p-contact has a resistivity of 1e-3 ohm-cm (col. 4, lines 45-)

c. It would have been obvious to one of ordinary skill in the art at the time of the invention to have oxidized the Ni portion of Ming-Jiunn's Ni/Au contact for the purpose

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of further increasing the light transmission through this portion of the p-contact as taught by Kamakura.

### *Double Patenting*

17. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

18. Claims 11, 15, 16, 18, 20, 26-31 and 35 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-18 of U.S. Patent No. 6,486,499. Although the conflicting claims are not identical, they are not patentably distinct from each other because the present claims are broader because they do not further recite limitations relating to the percentage of the interface area to the electrode. Also, while Krames '499 sets forth Au/NiOx/Al p-electrodes having absorption of less than 25% (e.g., claim 9/7) and a resistivity of  $< 10e-2 \text{ ohm-cm}^2$  (claim 11), these claims do not expressly recite that the reflectivity of the Al layer is  $> 75\%$ . Assuming arguendo that this latter limitation is not inherently met by former two recited characteristics, it was nonetheless well known that Al is highly reflective; as such, it would have been obvious to one of ordinary skill in the art at the

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time of the invention to have made the Al layer sufficiently thick so as to provide a reflectivity greater than 75% either because the use of Al itself, suggests applications for reflection, or in order to provide a layer sufficiently thick to ensure low resistance and proper bonding contact.

19. Claims 11, 15, 16, 18, 20, 26-31 and 35 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 3 and 10 of U.S. Patent application, 10/071,507. Although the conflicting claims are not identical, they are not patentably distinct from each other because the present claims are broader because they do not further recite limitations relating to the superstrate/substrate refractive index. Also, while the application sets forth Au/NiO<sub>x</sub>/Al p-electrodes having absorption of less than 25% (e.g., claims 3 and 10), these claims do not expressly recite that the reflectivity of the Al layer is > 75%.

Assuming arguendo that this latter limitation is not inherently met by former two recited characteristics, it was nonetheless well known that Al is highly reflective; as such, it would have been obvious to one of ordinary skill in the art at the time of the invention to have made the Al layer sufficiently thick so as to provide a reflectivity greater than 75% either because the use of Al itself, suggests applications for reflection, or in order to provide a layer sufficiently thick to ensure low resistance and proper bonding contact.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

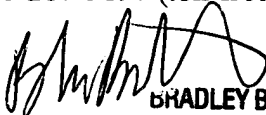
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***Contact Information***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to B. William Baumeister whose telephone number is (571) 272-1722. The examiner can normally be reached on M-F 8-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on (571) 272-1664. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
**B. WILLIAM BAUMEISTER**  
**PRIMARY EXAMINER**  
B. William Baumeister  
Primary Examiner  
Art Unit 2815

June 22, 2004